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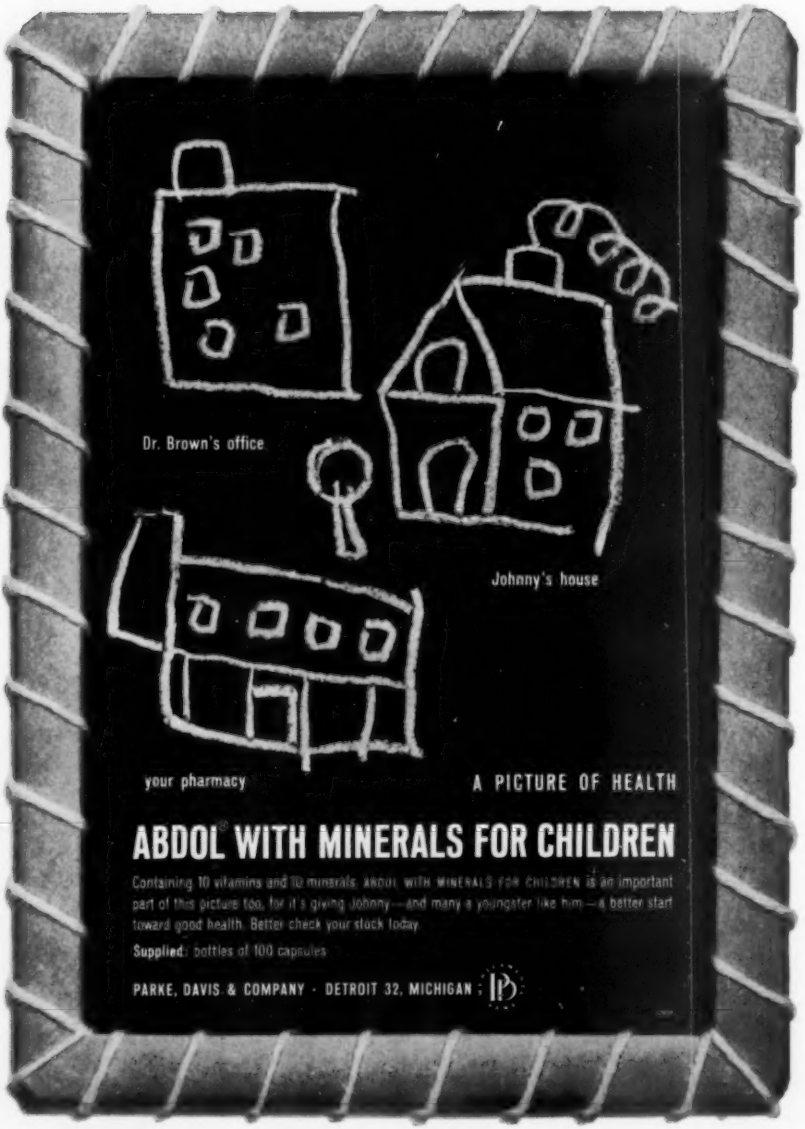
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AMERICAN JOURNAL OF PHARMACY

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Since 1825

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EDITORIAL

OVEREXERTION OR OBESITY?

WE were very much interested and impressed by some comments made recently by Dr. Theodore G. Klumpp in addressing a meeting of business executives. Dr. Klumpp, in discussing the cause of cardiovascular diseases, minimized the role of physical exertion in causing heart attacks and strokes in middle-aged and older persons. Dr. Klumpp, who has given considerable attention to the problems associated with aging, stated a well-established medical fact when he explained that the cause of cardiovascular disease lies more in the nature of the diet and obesity than in overexertion. Statistically, it has been shown that at least half of all heart attacks occur while the victim is either asleep or at rest and there is every reason to believe that what a person is doing at the time of the attack has nothing to do with causing the attack itself. He urged middle-aged and elderly people to avoid slowing down too much in their pattern of living and suggested that physical activity rather than shortening a person's life may actually lengthen it. Physical activity, indeed, has been shown to tone up the metabolism and even lower blood cholesterol levels, and there is very good evidence that a reasonable amount of physical and mental activity is most desirable in older persons. Only too often, we have seen a person who has lived a very active life retire, sit and do nothing, grow obese, and then die in a very short time.

It is very doubtful whether hard work does other than increase the life-span and there are many physiologic reasons for this. As we grow older, our energy requirements diminish and this lessened need for calories is still further curtailed if, by design or inclination, all forms of physical activity are eliminated. One's economic position and seniority rights have improved in most instances by the time middle age arrives and, consequently, most of us are not under the same economic pressure to do things for ourselves as we were when young. As a result, someone else cuts the grass, washes the car, and does all of the other household chores which once we did ourselves. In fact, it is almost a social stigma to do any work at all if one can

afford to have someone else do it. Coupled with this physical inactivity, the joy and pleasure which once could be obtained in the physical pursuit of sports is now less inviting, while the enjoyment of good food and drink remains. If anything, one becomes even more concerned with the nature of one's diet and enjoys rich food even more since every man, at least during middle age, is a gourmand at heart. The result is that our calorie intake is maintained or even increased while our energy requirements sharply diminish. Obesity is the inevitable result, with hyperlipemia and hypercholesterolemia an accompanying development.

Just why it is that some few persons can eat too rich a diet, grow obese, and still not have a hypercholesterolemia is one of the biochemical puzzles which we are still seeking to solve, but such persons are the exception rather than the rule. It is also well established that it is not hypercholesterolemia *per se* which causes atherosclerosis but the two are usually associated.

It is much easier for the middle-aged, lethargic person to believe that overwork and overexertion cause cardiovascular accidents since such a middle-aged person usually has a marked distaste for both work and exercise, combined with a fervent love of rich food in large amounts. To place the blame on one of the few things left in life which gives physical pleasure; namely, eating, would be to deny oneself almost all of present and anticipated pleasure. Nevertheless, as Dr. Klumpp points out, physical activity and a restricted diet are desirable. In some persons, the fear of death is so acute that it tinctures all their thoughts and plans and, to quote Dr. Klumpp, "Too many people are afraid to live for fear of dying". A reasonably active person is in a better physiologic condition to retard the aging process. Both mind and body, if they are not used, undergo a certain atrophy which soon limits the extent of use for which they are capable. The endocrine system slows down and, with it, metabolism until the individual is purely vegetative. Not only does this increase the rate of the degenerative processes but one no longer can be said to be truly living. Most of the really old and healthy people we have known have been people who have maintained a keen interest in things and kept physically active. Neither have we known a really grossly obese person who has lived to a very old age.

With our increased life-expectancy and the likelihood that a higher and higher percentage of people can potentially live to a ripe

old age, we need to revise greatly current beliefs concerning what one should do to get more years out of life as well as get more life out of years. There is surely no scientific basis for the common misconception that it is dangerous to be physically active when past the age of forty-five. Continued physical activity and something other than a preoccupation with eating, rest, and sleep should be the program for those who wish both to live long and to really live. To quote Dr. Klumpp once again, "If you just sit and wait for death to come along, you will not have to wait so long".

L. F. Tice

FURTHER STUDIES ON GERMICIDE-CELL SURFACE AND GERMICIDE-ENZYME REACTIONS EMPLOYING LOW TEMPERATURES [1]

By E. Kravitz,[2] R. L. Stedman,[3] M. Anmuth, and J. Harding
Philadelphia Naval Shipyard, Naval Base,
Philadelphia, Pennsylvania

Introduction

LEAKAGE of cell contents (lysis) has been assigned a primary role in explaining the antibacterial action of the quaternary ammonium compounds (QAC) (1, 2, 3, 4, 5), although agreement on this point is not complete (6). Recently, Stedman, Kravitz and King (7) have demonstrated that enzyme inactivation contributes more significantly to cell death than lysis *per se*, except in the presence of extremely high concentrations of QAC. The possibility of additional factors being involved in cell death was also suggested. It should be noted that different variables were studied under identical experimental conditions in this work, in contrast to the single variable experiments of other investigators.

The present paper describes an extension of the above studies. Certain recent publications (8, 9) have indicated an increasing interest in elucidating effects of low temperatures on both normal and disinfectant-attacked cells. It was felt that further data might be obtained by measuring the effect of temperature change on the differential contribution of enzyme inactivation and cell lysis to the over-all lethal reaction. Such experiments should yield valuable additional information on many problems associated with antibacterial activity in general and low temperature disinfection in particular.

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[1] The opinions expressed herein are those of the authors and are not necessarily similar to the views of the Department of the Navy.

[2] Dr. Kravitz is presently Assistant Director, Clinical Laboratory, Hospital of the Woman's Medical College of Pennsylvania, Philadelphia, Pa.

[3] Dr. Stedman is presently Head, Tobacco Investigations, Eastern Utilization Research and Development Division, Agricultural Research Service, U. S. Department of Agriculture, Philadelphia 18, Pa.

Method and Results

Since the calculation of classical Q_{10} values for specific reactions provides meaningful quantitative data on temperature effects, it was decided to determine Q_{10} values for enzyme inhibition, survival rate and lysis by established procedures. Accordingly, experiments were devised for this purpose and run at 0°, 10°, 20°, and 30° C. by the methods previously described (7): percentage reduction of the microbial population was determined by a survivor curve technic; cell lysis was measured by leakage of radioactivity from C^{14} tagged cells; and classical Warburg methods were employed for the determination of enzymatic activities. Preliminary findings indicated that the rate of oxidation of the various substrates was extremely slow at the lower temperatures, requiring long periods of observation for significant uptake (up to 16 hours) even in the absence of inhibition. The measurement of the inhibition reaction was obviously impractical. Therefore, the effect of temperature on only the uninhibited reactions was determined. This information can still be employed to obtain meaningful findings (see below).

The quaternary ammonium disinfectant (QAC) p-diisobutylphenoxyethoxyethyl dimethyl benzyl ammonium chloride, was used throughout the work at a QAC: cell ratio of 2:1 on a weight basis; this parallels the conditions employed in the previous study. *Serratia marcescens* (Detrick strain) was the bacterial species used. Cell death, for the purposes of this paper, was assumed to mean the inability of a cell to reproduce (form a colony) on agar plates.

In the Warburg studies, 8 mg. dry weight cells were used in each reaction vessel, instead of the 5 mg. per vessel employed in the previously cited work. Five substrates were studied at the 50 uM level: D-glucose, pyruvate, L-glutamate, L-alanine and succinate. Earlier, only glucose had been used.

The results showed that values of Q_{10} for the loss in either germicidal activity or enzyme activity were greater for the 0°-10° C. range than at higher ranges of temperature. A Q_{10} greater than 10 was obtained for germicidal activity for the temperature range of 0°-10° C. As can be seen in Table 1, the extreme lack of anti-bacterial activity in this range was in sharp contrast to the Q_{10} values of 2.3 and 1.9 obtained for 10°-20° C. and 20°-30° C., respectively.

Table 2 illustrates the increases in Q_{10} for five representative oxidative systems. For the 0°-10° C. range, Q_{10} values varied from

3.4 for glucose to 10.3 for L-alanine; these values were greater than those obtained for the 10°-20° C. and 20°-30° C. ranges (1.9-2.4).

The ability of QAC to cause leakage of cell content (lysis) was then studied at four temperatures: 0°, 10°, 20°, and 30° C. It soon became apparent that the pattern of cell lysis was markedly different from either of the other two properties studied. A large amount of leakage occurs very rapidly at first (<30 seconds), followed by a long, secondary period during which leakage still continues, but at a greatly diminished rate. The second phase is probably a slowed-down extension of the original lysis, rather than an independent type of reaction. This point has been discussed previously (7). Since we have been unable to measure the extremely rapid primary lysis, Q_{10} values based upon maximum velocities of reaction cannot be calculated. Nevertheless, cell death and lytic properties have been compared in another manner. This has been done by tabulating the percentages of lysis obtained at various temperatures at comparable exposure times (Table 3) and comparing with Tables 1 and 2. It can be seen that even a large drop in temperature does not result in a significant drop in lytic activity during a given time period. A reduction in temperature of 30 degrees results in a loss in lytic activity of no more than about fifty per cent, or a Q_{30} between 1 and 2 (the Q_{30} for a reaction exhibiting a conventional Q_{10} of 2 would be 8). This is in contrast to the greater differences observed in either enzyme oxidation rates (Q_{30} between 14 and 51) or germicidal activity (Q_{30} >44).

TABLE 1

Q_{10} VALUES FOR THE ANTIBACTERIAL ACTIVITY OF THE QUATERNARY AMMONIUM COMPOUND ON SERRATIA MARCESCENS *

Temperature Range	Q_{10}
20°-30° C.	1.9
10°-20° C.	2.3
0°-10° C.	>10

* 0.5 ml of the bacterial suspension (adjusted to a Klett reading of 200) was mixed with 5.0 ml of a 1:10,000 dilution of p-diisobutylphenoxyethoxyethyl dimethyl benzyl ammonium chloride. Survivors were plated in agar at various time intervals. Q_{10} values were based on the exposure time needed to attain 100 colonies per 0.1 ml sample.

Discussion

The data given substantiate our previous conclusions concerning the role of lysis in the death of the bacterial cell (7). In contrast to the opinions of certain other workers (1, 2, 3, 4, 5), the present work further shows that mechanical leakage of cell contents probably plays a minor role in cell death, at other than very high concentrations of QAC. Even though the extreme rapidity of the initial phase of the lytic activity makes it impractical to calculate a conventional Q_{10}, little or no difference in the amount of lysis can be observed between 0° C. and 30° C. at any given exposure time. The rate of cell death, on the other hand, does vary considerably throughout this same temperature range.

Q_{10} values of inhibition reactions between enzymes and QAC could not be calculated at the lowest temperatures. Therefore, the determination of contribution of enzyme inactivation to over-all death cannot be made by quantitative comparison of the kinetics, relative to temperature, of such reactions. However, the Q_{10} values of uninhibited enzyme reactions are available. These Q_{10} values represent the theoretical minimum values obtainable in the presence of inhibitor, with one exception, which is described below. By comparing these Q_{10} values with those of survival and lysis, a valid qualitative comparison of the possible effect of enzyme inhibition can be made. It can be seen, therefore, that the Q_{30} values of the enzyme reactions (between 14 and 51) are more closely related to the Q_{30} of the killing reaction (>44) than to the Q_{30} of lysis (between 1 and 2).

TABLE 2

Q_{10} Values for Various Oxidative Systems of Serratia marcesens

	Q_{10}*		
Substrate	20°-30° C.	10°-20° C.	0°-10° C.
D-glucose	2.1	1.9	3.4
pyruvate	2.2	1.9	5.2
L-glutamate	2.4	2.2	3.6
L-alanine	2.1	2.0	10.3
succinate	2.1	2.4	10.1

* Q_{10} calculations were based upon the maximum reaction rates, usually attained during the first 30 minutes. Each Warburg flask contained 8.0 mg. dry weight cells and 50 uM substrate in 0.067 M phosphate buffer (pH 7.0).

The exception noted can theoretically occur if the enzyme inhibition reaction at X° C. proceeds at a velocity which is greater than a similar reaction at (X-10)° C. due to abrupt loss of inhibitory activity. In this event, evidence is still provided that enzyme inactivation contributes to death, since the abruptness of loss of inhibitory activity parallels the drop-off in killing rate.

The present series of studies further suggest the existence of even another factor (or factors) in the over-all picture of "kill." This could well involve interference with reproduction or cell growth, possibly related to ribonucleic acid and deoxyribonucleic acid synthesis, as previously noted (7). Considering the complex and heterogeneous nature of bacterial cell walls (10), one might also suspect phenomena related to permeability and adsorption, as well as other biochemical and physico-chemical forces. Also, the possibility exists that, at certain temperatures, different forces may come into play more prominently than at other temperatures. A definitive, final answer still remains to be elucidated.

Summary

The possible relationship of leakage of cellular material (lysis) and oxidative enzyme activity to bacterial death was studied at temperatures between 0° C. and 30° C., using *Serratia marcescens,* five representative substrates, a quaternary ammonium disinfectant and

TABLE 3

LYSIS OF RADIOACTIVE SERRATIA MARCESCENS CELLS BY THE QUATERNARY AMMONIUM COMPOUND

Exposure Time (minutes)	Percentage Lysis *			
	30° C.	20° C.	10° C.	0° C.
5	6.2	6.1	5.2	3.7
30	6.0	7.6	5.7	6.0
60	9.1	7.8	7.0	6.5
120	12.3	9.5	7.6	6.5
240	13.3	12.3	8.8	7.7

* Mixtures of 20 mg. C^{14}-tagged *S. marcescens* cells and 40 mg. p-diisobutylphenoxyethoxyethyl dimethyl benzyl ammonium chloride were prepared in distilled water (10 ml. final volume). At indicated intervals, aliquots were removed, filtered through a membrane filter and radioactive distribution determined as previously described (7, 11).

a radioisotopic technic. It was concluded that there is a probable parallel between cell death and the lowering of enzyme activity, although not necessarily on a quantitative basis, and that lysis is not the primary lethal factor contributing to cell death.

The possible existence of additional factor(s) related to cell death, i.e., interference with growth, reproduction, permeability, etc., was emphasized, as was the possible variable importance of different factors at different temperatures.

The above tends to substantiate previous conclusions published from this laboratory.

Acknowledgments

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SOME NOTES ON PEYOTE

(*Lophophora Williamsii*)

By Lawson G. Kloesel *

Description

HABITAT and Physical Characteristics. The natural habitat of peyote is in the Rio Grande Valley in southwestern Texas and northeastern Mexico. This small cactus occurs on certain hillsides in colonies. The blossoms appear at intervals during the period April to November. The cactus is flabby and hemispherical in shape, with tuberculate ribs numbering about eight to ten. It has a large tap root which resembles a carrot or parsnip. The color of the flower it bears varies from white to pink. It blossoms from about ten in the morning until the late afternoon. The plant is blue-green in color and rises about one inch above the surface of the soil which is usually sandy loam or clay flats. Small tufts of wool-like hair appear at intervals of one-half to one inch all over the top portion. The breadth of the plant is about two inches, and its length, including the root, averages about six inches. Many of these plants grow under thorny shrubbery. They are sometimes found on the south side of gravel hills, but rarely on top. Peyote matures very rapidly, and produces naked, black seeds.

The mescal button is the top part of the plant which has been cut off, sliced, and dried. The buttons are about fifty millimeters in diameter, and six millimeters in thickness with a convex undersurface. They have a hard and brittle texture when dry, and are soft when wet. An odor which is peculiar and disagreeable is noticed in the moist form of the drug, and it is particularly marked in the powdered drug.

Synonyms. Peyote is the old Indian or Aztec name for *Lophophora Williamsii*. Other names applied to this plant are diabolic root, devil's root, sacred mushroom, dry whiskey, and dumpling cactus. Indian names for peyote are Hikula, Kamaba, and Wakowi. People

* College of Pharmacy, the University of Texas, Austin, Texas.

living in the United States often refer to peyote as mescal, or mescal button, while it is called challote in Starr County, Texas.

Botanical Classification. The botanical name for peyote is *Lophophora Williamsii* or *Lophophora Lewinii*. It is a member of the *Cactaceae*. The generic name, *Lophophora,* is from λόφος meaning crest, and φορεω meaning I bear, referring to the pencil hairs borne at the areole (1). There were two species named, but further investigation has proven that these are one and the same plant. Ludwig Lewin published the first systematic study of the plant.

Lophophora Williamsii is the only species that produces an orgy of vision. However, three other species of cactus have been called peyote by Mexicans and Indians, and these should not be confused with the true peyote. *Astrophytum capricone* is often mistaken for peyote because it grows associated with *Lophophora Williamsii*. The Mexicans call *Pelecyphora aselliformis* peyote because it is said to possess medicinal properties. It is generally known as *hatchet cactus*. *Anhalonium fissuratum* is also known as peyote and is often mistakenly called "dry whiskey" because, when chewed, it produces an inebriation. The latter cactus is also known as "living rock" because it grows among rocky soil and is very difficult to see.

Drug Classification. Peyote is listed as *Anhalonium Williamsii Lewinii* in the *Dispensatory of the United States* (2). Lewin classed this plant with poisonous drugs when he found that a small amount produced dangerous symptoms. It is classed legally as a narcotic but it is not habit-forming. Peyote has been the subject of much study in regard to its chemical, medicinal, and therapeutic properties. The narcotic law of Texas states: "'Narcotic drugs' means coca leaves, opium, peyote, mescal bean, and cannabis and every substance neither chemically nor physically distinguishable from them". This law is enforced in most parts of Texas, and on several occasions people have been arrested and fined for the sale of peyote.

Actions. From time immemorial the Kiowa Indians of the Rio Grande have used mescal buttons for the purpose of producing intoxication during religious ceremonies (3). It produces a form of delirium, and has been described as having an action similar to the combined action of strychnine and digitalis. Consumed in a solid form, it causes a nausea, but it acts as a stimulant of the central

nervous system, and causes a distortion of the visual center. This in turn, produces for the eyes, hallucinations in "technicolor", revealing an optical fairyland.

The pupils of the eye become dilated, and perception may be delayed. There is an increase in the heart beat and a nervous stimulation. The muscular system is depressed, and frequently a twitching of muscles is noticed. A sense of time is lost and the reflexes are increased. Although there is not a loss of consciousness, a feeling of exhilaration is felt, and the face is flushed.

According to Huxley, when administered in suitable doses, it changes the quality of consciousness more profoundly and yet is less toxic than any other substance in the pharmacologist's repertory (4).

Peyote, the Indian God

Origin. Many Indians believe that peyote was left for them as a great remedy when their god went to heaven. The exact way peyote found its way into the United States is not known. The Indians have many tales regarding the origin of peyote. One tale of an old man who found himself alone after his tribe had lost a battle in a great war has been passed from Indian to Indian (5). The old man despaired of saving himself and decided to await death where he was.

"All my people have been killed," he said to himself. "Our enemies are going to kill me also. I will give myself up."

He lay down on his stomach and hid his face in his hands. He waited. Soon he heard a person approaching from the east.

"Surely," he said to himself, "This is one of my enemies".

He heard him coming, and waited, expecting to be killed. He heard the person come right up to his head. He was sure now that he would be killed. He waited, but instead he heard the man, who was Peyote, say:

"I have come here not to kill you, but to bring you a good message. You know that many of your people have been killed and scattered in all directions. I have come here to tell you what to do and to take away all your troubles. Your own children are safe. Now, I want to teach you something which you will transmit to your people. Do as I tell you and no trouble will come to you from anywhere. Your people will not be killed any more. This is what I look like. You will find me around here."

The man opened his eyes, looked around but saw no one. He felt the Peyote plant in his hand. Then Peyote spoke again and taught him what to do. Peyote gave his power to the man. The man went back to his people and told them that Peyote had come to him. He told his people not to worry, that everything would be all right. There would be no more trouble. Everything would be good. But Peyote had said:

"There are several different ways that you can use me, but unless you use me in only one way, the right way, I may harm you. Use me the right way and I will help you."

The word peyote is thought to be a corruption of the Aztec "peyotl" (6).

A Peyote Meeting. According to the Indians one must have a good reason for holding a Peyote meeting. The worshipers in such a meeting try to make their thoughts travel on the Peyote road to reach the Creator. Most tribes have only four reasons for holding a Peyote meeting. The most frequently used reason is to show hospitality to visiting Indians. Other reasons for holding a meeting are: in time of trouble, in case of sickness, and for the welfare of the community.

The ceremony is usually held on Saturday night, and it begins at about ten o'clock. One man is chosen as the host, and he must make the necessary preparations and furnish the peyote, or mescal buttons. It is held in a *tipi*, and the men sit around a fire which burns brightly all night. There is usually a crescent-shaped mound of dirt in front of the fire on which the sacred peyote is placed. The arrangement of the *tipi* differs according to the various tribes.

The host passes out four mescal buttons to each member and, after eating this, each one prays silently. Drums are beaten, and rattles are shaken all night long, as they continue to eat the mescal buttons and sing. At midnight, water is brought in and they hold a baptismal ceremony. The ceremony is continued until about nine o'clock in the morning of the following day.

In the meeting, everyone eats as much peyote as he pleases, but only after the host's supply has been exhausted may guests consume their own peyote. Throughout the night, the Indians taking part in the ceremony are absorbed in color visions and the manifestation of the mescal intoxication. After the ceremony each Indian goes to

his own home and returns in about two hours with his family. The host then gives a feast for those that have returned.

Peyote is taken in three forms: the green plant, the dry button, and in tea which is given to the women and the sick. Indians not living in Texas make annual pilgrimages to the Rio Grande Valley to gather a supply for worship.

The Indian Problem. The use of peyote by Indians has become a problem. Many of them do not use it for religious purposes, and they have become shiftless and arrogant. Some of the Indians make a habit of taking peyote, although it is not habit forming. There have been cases where Indians would sell their livestock in order to get money to buy mescal buttons. Another problem is that of the younger Indian men who travel from tribe to tribe trying to gain cheap notoriety or some sort of recognition by introducing "Peyotism" as a new form of religion (7). There has been much publicity of peyote in newspaper stories, but almost all of these are exaggerated.

Peyote and Religion. Peyotism is still a form of worship in the Native American Church of the United States. The mescal rite is considered to be the chief religion of all of the tribes of the Southern Plains of the United States (8). A number of Indians think of Jesus as the white man's Peyote, and that for them the Road to the Great Spirit is the Peyote Road, while the white man's is the Jesus Road (9). There has been much opposition to the Indian's consumption of peyote by people who are trying to help the Indians. Many people wrote letters to the Bureau of Indian Affairs asking them to put a stop to "Peyotism". All of this took place before an extensive study of the drug and its alkaloids was conducted. The Roman Catholic Church is, however, still opposed to this form of religion, calling it a kind of paganism. They base their accusations on the fact that the Indians venerate the cactus, and not their Great Spirit.

"In 1922 the members of the Peyote cult at Taos Pueblo offered themselves to full scientific investigation to include pharmacological, biological, physiological, and social experimentation by the National Research Council. In 1952, the Council had still not taken action on the investigation. This thirty-year lapse of time or non-action was probably due to the constitutional fact that 'everyone is guaranteed a right to freedom of worship'" (10).

There are many vandals who sell peyote to the Indians and then claim the sanction of the Bureau of Indian Affairs.

Alkaloids

Alkaloids of Peyote. Almost all of the work done on extracting the alkaloids from peyote has been done in Europe. Mescal buttons have been imported into Europe for use in medicine. Ewell claims that the active drug contained in peyote does not lie in the alkaloids, but in certain resinous bodies which he discovered (11). Janot and Bernier found that in peyote the alkaloids are almost exclusively located in the internal cells of the cortical parenchyma at the top of the plant. The alkaloidal yield from the central epidermis was about 0.29 per cent (12). The alkaloids belong to the isoquinoline group. There have been eleven alkaloids isolated from peyote, but only eight of them will be discussed within the text of this report.

Anhalamine. Anhalamine was first isolated by Kauder. Its yield is 0.1 per cent. The chemical formula is $C_{11}H_{15}O_3N$, and it occurs as microscopic needles. It has a melting point of 187-188° C. The base contains two methoxyl groups and one hydroxyl group. The physiological actions are similar to that of mescaline and will be taken up when that alkaloid is discussed.

Anhalinine. Anhalinine was first isolated by Spath and Becke. The alkaloidal yield is 0.01 per cent. It has a melting point of 61-63° C. and is a free base. It is identical with the methyl ether of anhalamine. The chemical formula of anhalinine is $C_{12}H_{17}O_3N$. The physiological actions are similar to that of anhalamine.

Anhalonine. Lewin discovered anhalonine. Its yield is 3.0 per cent. Its chemical formula is $C_{12}H_{15}O_3N$ and contains one methoxyl group and a methylenedoxy group. It crystallizes from light petroleum as needles, melting at 85.5° C. An increase in the reflex excitability after a phase paresis is noticed when the substance is injected into a frog. The symptoms in rabbits are similar, but the transitory paresis is less marked, and hyperexcitability predominates. The lethal dose in rabbits is 0.16 to 0.2 gram per kilogram of body weight.

Anhalonidine. Heffter discovered anhalonidine, and he found it to yield 5.3 per cent of the alkaloids as the free base which crystallizes

in small octahedra, melting at 160-161° C. and the chemical formula is $C_{12}H_{17}O_3N$. The alkaloid contains two methoxyl groups. Lewin attributes certain hallucinating power to this alkaloid. In some repects, it resembles pellotine in its actions. It produces a type of narcosis or paresis followed by a phase of excitability in the frog. Large doses caused complete paralysis. No significant effects were noticed in mammals.

Lophophorine. Lophophorine is the most toxic of the bases of peyote. It was detected by Heffter, and its yield is 0.5 per cent as an oily base with the chemical formula of $C_{13}H_{17}O_3N$. Insoluble in water, and soluble in organic solvents, its melting point is 171-172° C. Upon an injection of 0.25-1.0 mgm. of the hydrochloride, a long-lasting tetany is provoked in the frog. The animal recovers, but there is a lingering excitability. In the rabbit, 7 mgm. per kilogram of body weight produced hyperexcitability and accelerated respiration; the lethal dose is 15-20 mgm. per kilogram of body weight, and 12.5 mgm. provokes tetany. An intravenous injection of 2.5 mgm. caused an increase in blood pressure and larger doses, a decrease. There was no effect on the heart.

Pellotine. It is believed that this alkaloid could be used safely as a narcotic by man. Heffter isolated 0.74 per cent pellotine in the fresh peyote plant. The melting point is 111-112° C., and it crystallizes from alcohol in tablets. The chemical formula is $C_{13}H_{19}O_3N$, and it contains a methylimino group, two methoxyl groups, and a phenolic-hyroxyl group. It is only slightly soluble in water. Doses of 5-10 mgm. caused temporary convulsions in frogs, cats, and dogs. In chlorased dogs, 5 mgm. per kilogram of body weight slowed the heartbeat and caused a decrease in blood pressure; these effects lasted for a few minutes and resembled those due to acetylcholine: they were inhibited by atropine and increased by yohimbine and ergotamine (13). Phenobarbital inhibited the effect of convulsions produced by injections of the above dose at short intervals.

Mescaline. Mescaline is the most active of the peyote alkaloids. Heffter isolated the alkaloid from peyote with a yield of 6.3 per cent. The melting point is 35-36° C. and, as a liquid, it is a colorless alkaline oil. It absorbs carbon dioxide from the air to form a crystalline carbonate and is somewhat soluble in water, alcohol, and chloroform,

but only slightly soluble in ether. The chemical formula is $C_{11}H_{17}O_3N$, containing three methoxyl groups. Spath arrived at the correct structure of mescaline.

This alkaloid is the one responsible for visual, color hallucinations which are accompanied by tachycardia, dilation of the pupil, loss of accurate time, nausea, faintness, and headaches. The other alkaloids do not have this effect. Mescaline produces narcotic effects in frogs. The lethal dose for rats is 20 mgm. per 100 grams of body weight. Rabbits are ordinarily resistant.

Slotta and Mueller (14) observed the following strange behavior of a dog after administering 0.2 gram. The dog started to whine and bark not at the observer but towards the opposite end of the cage; when called it turned and wagged its tail. According to Raymond and Hanut (15), small doses of mescaline do not have any effect on the blood pressure of dogs, while larger ones cause hypertension. Mescaline is antagonistic to the pressor action of adrenaline and the subsequent vagal effect. It stimulates the contractions of intestine and uterus *in situ* but not that of the isolated organs. Grace (16) observed that mescaline produces respiratory depression and a fall in blood pressure when injected intravenously into anesthesized cats and dogs.

Anhalidine. Anhalidine was found by Spath and Beck, and gives a yield of 0.001 per cent. Its formula is $C_{12}H_{17}O_3N$ and it is the N-methyl derivative of anhalamine. It sublimes in high vacuum at 85-95° C. melts at 113-133° C. There is not yet too much known about this alkaloid.

Personal Experiences

Vincenzo Petrullo. Mr. Petrullo tells of a Peyote meeting he attended at Anadarko (17). This meeting was given by the Delaware Indians. The Indians called this form of meeting a Big Moon Meeting. The entrance to the *tipi* is at the east, and a fire is built in the middle of the floor. There is a crescent-shaped mound opposite the entrance on which is placed some sacred Peyote. The worshippers sit in a circle and gaze at the Peyote during the ceremony. The host, or road chief, sits on the Peyote Road or behind the half Moon which is in line with the entrance.

Two other chiefs are employed in this type of meeting: a drum-chief, who cares for the drum, and a fire-chief, who tends the fire and watches the door.

Petrullo took part in all phases of the meeting, but reported that he was too curious to concentrate as he was asked by the hosts. He did not suffer any physicial discomforts, did not see any vision, and he felt no after-effects. It was only by accident that Petrullo was allowed to partake in the meeting. The Indians thought that he was of Delaware descent; if they had known he was pure White, he would not have been permitted to attend.

Aldous Huxley. Eager to have the chance of gaining entrance to another type of world, Aldous Huxley allowed himself to be the subject to experimentation by some scientists in California (18). He swallowed four-tenths of a gram of mescaline dissolved in a half glass of water. Mr. Huxley saw no visions, but he did see dancing colors of red, gold, blue, and grey. He claimed that the change was "in the realm of objective fact". He was very enthusiastic about the type of intoxication he underwent. Huxley thinks that everyone should have a chance to take some of this drug at some time during his lifetime.

The doors of the objective world are closed to many people, and he thinks that possibly mescaline would open this door for them. He states that any man who comes back through this "Door in the Wall", as H. G. Wells calls it, will be "wiser but less cocksure, happy but less self-satisfied, humbler in acknowledging his ignorance yet better equipped to understand the relationship of words to things, of systematic reasoning to the unfathomable Mystery which it tries, forever vainly, to comprehend".

W. E. Lowery. A letter from Dr. Lowery (19), of El Paso, Texas, to Dr. C. C. Albers, Professor of Pharmacy, College of Pharmacy, University of Texas, tells of his experiences with peyote. He has done extensive work with the plant, and has taken as much as six fluid ounces of the fresh juice. The juice is not an intoxicant, produces no exhilarating effect, and acts more like a sedative to him.

Upon drinking the juice, he lay down on a couch. He found great difficulty in getting up to take notes on the sensations the drug in peyote was causing. He stated that there was an equal difficulty in sitting down again. Sleep followed the sensations, and he saw

visions of brilliant colors upon closing his eyes. A headache followed.

Dr. Lowery went on to describe the words of an Indian who was questioned about peyote—"Indian that uses peyote is always good Indian, don't fight, don't drink, don't steal, don't run after women".

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(17) Petrullo, *op. cit.,* pp. 87-95.

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(19) Communication from Dr. W. E. Lowery of El Paso, Texas to C. C. Albers of Austin, Texas.

HERPES SIMPLEX

By L. F. Tice

Herpes simplex is caused by a virus, as is herpes zoster. The former produces the characteristic "fever blister" or "cold sore" but it can also cause much more serious conditions and even death. Herpes zoster infection is a very painful disease commonly known as shingles. In this article, the nature of herpes simplex is discussed since the pharmacist is frequently asked about it.

THE virus causing the various manifestations of herpes simplex is widely distributed and almost no-one escapes some contact with it. In many instances, infection with this virus goes unrecognized; in others, it causes the typical fever blister; and, in its more serious forms, it can involve the intestinal tract, the genitalia, the brain, conjunctiva, and cornea.

The virus of herpes simplex usually produces an immunologic response in humans but not sufficient antibodies to prevent recurrences. The infant is usually protected by maternal antibodies for the first six months of life but, occasionally, an infant during birth may acquire a fatal visceral infection from the lesions on the mother's vulva.

Carriers

The virus is carried by many persons, most of whom have no sign of the infection. In such persons, it can be identified in the saliva. The unrecognized disease must be much more prevalent than is suspected, since neutralizing antibodies against it are found in almost all adults. In this, the situation is similar to that with poliomyelitis. Here, too, many people have a non-paralytic, and—therefore—an unrecognized, attack producing antibodies in the bloodstream. The antibody titer in herpes simplex can diminish in time but, in most persons, it is maintained probably by repeated unrecognized attacks.

Early Attack

The first acute systemic infection with herpes virus usually occurs in children under two years of age. Oral lesions which are

very painful form, and fever and swelling of the lymph glands ensue (acute herpetic gingivostomatitis). The infection may go unrecognized unless the child has difficulty in eating. In the early stage, vesicles appear which may not be very sore. These then rupture producing erosions of the mucosa which are very painful. While this first acute attack stimulates antibody production, it does not prevent further attacks. Subsequent attacks, however, only produce localized vesicles such as on the mouth, the traumatized skin, or the vulva.

Some workers believe that once a lesion has formed the virus becomes fixed at that point and multiplies profusely whenever tissue resistance is lowered; e.g., in sunburn, fevers, trauma such as excessive kissing, etc. This may explain why a given individual always seems to have recurrent "fever blisters" at the same circumscribed area on the lips. Even an emotional upset or menstruation is believed to trigger an attack in many individuals. Again, it is not clear whether such repeated attacks represent a reinvasion by the virus or its reactivation.

Lesions

The typical lesions of herpes simplex on the skin or lips are groups of vesicles filled with a clear fluid. Even before the lesions form, the individual usually experiences a burning, itching, and swelling at the site. This is followed in a few hours by the lesions themselves. After a few hours or a day, the vesicles break or the fluid becomes infected with bacterial invaders. The lesions then become yellow and infected, and crusts form. While some swelling of the site takes place, the deeper tissues are not indurated.

On the oral mucosa, the vesicular stage is rarely seen and a graying eroded area appears surrounded by a reddened, inflamed margin (aphthous ulcer). This is the typical "canker sore".

Other lesions appear on the lips or in the mouth and must not be confused with simple herpes. Among these are syphilitic chancres and Vincent's infection (trenchmouth). The chancre of syphilis causes more swelling of the tissues and lymph nodes. In Vincent's infection, the gums are involved rather than the softer mucosal tissues.

Complications

While herpes simplex most often affects the lips, face, and mouth, it can cause lesions elsewhere. The genitalia are sometimes affected (herpes progenitalis) with quite similar lesions appearing on the

contiguous skin. The cornea may also be invaded (herpes corneae) with a resulting ulcerative keratoconjunctivitis. This leads to severe systemic manifestations and 10 to 20 days are required for complete healing. Recurring herpes of the cornea is usually less severe than the initial attack but it may lead to a keratitis and even corneal scarring. Iritis may also result.

The most serious complication of herpes is an encephalitis. This is quite similar in its clinical picture to other forms of viral encephalitis and it is often fatal within a two week period. As was mentioned earlier, a fatal visceral herpes can cause the death of the newborn, such infection being acquired from the mother.

Eczema Herpeticum

A child with eczema can become inoculated with the virus and develop a generalized vaccinia very similar to that caused by vaccine virus. It is called eczema herpeticum today although it once was known as Kaposi's varicelliform eruption. Many large clear vesicles form all over the skin, the child is quite ill with a fever, and the lymph nodes are swollen. If the child has few or no protective antibodies, it can be fatal. In the older child or adult, it may not be severe enough to be noticed and it may be thought as only a temporary exacerbation of the existing eczema.

Prophylaxis

Since the virus of herpes simplex can be transmitted from person to person, contact with those having visible herpes should be avoided. Small children who are particularly susceptible to the infection and its more severe forms should be kept away from those with the lesions. A child with eczema must also be protected to avoid the possibility of inoculation and the development of eczema herpeticum.

Those who are highly susceptible to recurrent attacks of herpes should avoid those conditions which "trigger" an attack. For example, if sunburn causes it, a screening agent should be used on the lips when prolonged exposure to the sun is anticipated. It should be an oleaginous product not easily removed by water or saliva. An example is 5 percent phenyl salicylate in petrolatum. There is some evidence that a deficiency of the B-vitamins predisposes one to herpes and they should be used prophylactically together with ascorbic acid.

At times, antihistamines will abort an attack of herpes if taken early enough.

Treatment

The treatment selected in herpes simplex is determined by the area of the body involved and the intensity of the attack.

The lesions on the lips in their earliest stages can sometimes be aborted by the topical application of camphor spirit or alcohol. Another drying preparation useful in the first stages is calamine lotion. After crusting has begun, an astringent wash such as aluminum acetate solution should be used alternating with some emollient ointment. There is some evidence that a topical ointment containing one of the tetracyclines and hydrocortisone or one of its analogues is useful. The antibiotic curtails secondary invaders and the steroid reduces inflammation.

The oral lesions of herpes simplex, if they are very few in number, can be treated by the careful application of some caustic. Even an alum styptic pencil can be used for this purpose. A dental ointment containing a tetracycline and hydrocortisone may also be applied with advantage.

If the ulcerous lesions are numerous, cauterization should not be carried out. The mouth can be washed with a dilute sodium bicarbonate solution and anesthetic troches (benzocaine) used to give relief from pain. Vitamin B complex should be given orally to curtail the attack.

When the cornea is involved, hydrocortisone should not be used since it may cause perforation of a hypopyon ulcer (in the anterior chamber of the eye) should one exist.

If the infection is severe as in a primary attack with systemic febrile manifestations, the patient's dehydration and acidosis must be corrected by parenteral fluid therapy. Large doses of gamma globulin may also be helpful by reason of its antibody content. No known antibiotic is effective against this virus but the use of broad spectrum antibiotics is of value topically to restrain the secondary invaders which inflame and delay the healing of the lesions.

1958 MEETING OF THE PLANT SCIENCE SEMINAR

FERRIS Institute was host to the 35th Annual Plant Science Seminar from August 18th through the 22nd. The Local Committee included the following:

Dr. Karlis K. Kazerovskis, *Chairman*
Dr. Edward P. Claus, *Secretary*
Dr. Norris W. Dunham
Dr. James A. Freck

The Seminarians were welcomed by Dr. Victor F. Spathelf, President of Ferris Institute.

Scientific papers presented included the following: PRACTICAL ASPECTS OF HERBICIDES by Dr. B. H. Grigsby, Michigan State University; FUNGAL INFECTIONS by Dr. E. S. Beneke, Michigan State University; THE IMPACT OF THE LUMBERING ERA ON MICHIGAN'S ECOLOGY by Dr. G. R. Wheeler, Central Michigan College; THE USE OF RADIOACTIVE ISOTOPES IN AQUATIC BIOLOGICAL RESEARCH AND TEACHING by Dr. L. L. Curry, Central Michigan College; THE EFFECT OF GAMMA IRRADIATION (COBALT-60) ON POTATO PLANTS (Solanum tuberosum L.) by Dr. Mary L. Anderson, Detroit; ALKALOIDS OF THE GENUS *Vinca* (APOCYNACEAE) WITH SPECIAL REFERENCE TO *Vinca major* by Mr. Norman Farnsworth, Pittsburgh; A PHYTOCHEMICAL INVESTIGATION OF THE LEAVES OF *Pyrularia pubera* MICHX. (SANTALACEAE) by Mr. Ralph N. Blomster, Pittsburgh; A HISTORICAL SKETCH OF THE USES OF MISTLETOE (*Viscum album*) by Dr. Anna Koffler, Ohio Northern; STUDIES OF THE GENUS *Thymus* by Dr. I. Hassan and Dr. Marin Dunn, Philadelphia.

A collaborative pharmacognosy laboratory session was moderated by Dr. Edward P. Claus. Participants included:

Dr. Harold E. Bailey, Wayne State University
Dr. Egil Ramstad, Purdue University
Dr. Frank J. Pokorny, Columbia University
Dr. Karlis K. Kazerovskis, Ferris Institute

Tours and field trips included a visit to the Dow Chemical Company experimental farm and greenhouses where materials are screened

for insecticidal, fungicidal, and herbicidal activity. Local geology and flora were observed under the direction of Dr. George Wheeler of Central Michigan College.

The Edwin Leigh Newcomb awards were presented by Dr. Heber W. Youngken, Sr. at the annual banquet. The undergraduate award was given to Mr. Charles W. Dickerson of Ferris Institute. The graduate and faculty awards were given to Dr. Mahmoud D. Sayed of Rhode Island and Dr. Jack L. Beal of Ohio State University respectively.

New officers elected for 1958-59 were:

Chairman	Edson F. Woodward
First Vice-Chairman	Mary L. Anderson
Second Vice-Chairman	Frank J. Pokorny
Secretary-Treasurer	Frank L. Mercer

Executive Committee:

J. Hampton Hoch	Frank L. Mercer
Carl Johnson	Arthur Schwarting

Edson Woodward

FRANK L. MERCER,
Secretary-Treasurer
Plant Science Seminar

SELECTED ABSTRACTS

In Vitro Method for the Determination of the Release of Amphetamine Sulfate From Sustained Release Capsules. Royal, Joseph. *Drug Standards 26:*41 (1958). The U. S. P. apparatus for the tablet disintegration test was modified by inserting a 40 mesh copper wire gauze between the lower plastic plate of the basket assembly and the 10 mesh stainless steel wire cloth. A plain plexiglass disk of 1 cm. thickness and 2.1 cm. diameter (0.5 mm. less than inside diam. of tubes) was placed over the sample in each of the six tubes. The plastic disks rode freely up and down the tubes and provided a gentle rubbing action on the sample. Samples of 1.5 Gm. of the capsule contents were placed in each of the six tubes of the apparatus. The tubes were then immersed in 600 ml. of simulated gastric juice in a 1 L. beaker held rigidly in a constant temperature bath. Samples of 25 ml. were removed from the reaction beaker after 5-, 15-, 30-, and 60-minute intervals. The gastric juice was then removed and simulated intestinal juice was substituted. Samples of 120 ml. were withdrawn after 2-, 4-, and 6-hour intervals. After each sample was withdrawn, fresh juice was added to the reaction beaker to maintain the volume. The samples were then assayed.

The assay results obtained were presented by the authors. Both the N. N. R. titrimetric assay procedure and a spectrophotometric procedure were used.

The author indicated that the results obtained may or may not simulate the release pattern in humans. However, it was felt that the results obtained with this *in vitro* test method indicate that the test should prove useful as a simple screening method.

Nephrosis as a Result of Mercurial Diuretic Therapy. Riddle, M., Gardner, F., Beswick, I., and Filshie, I. *Brit. Med. J.* No. *5082:*1274 (1958). Although mercurial diuretics are powerful weapons in the treatment of congestive heart failure, it is well recognized that these drugs are potentially dangerous because of their action on the renal tubular epithelium. The authors reported five cases—three of which terminated fatally—in which nephrotic syndrome developed, apparently as a result of the use of mercurial diuretics.

The patients had received several mercurial diuretics, both of the oral and parenteral types, for periods ranging from 14 months to over 4 years. At necropsy, in the three fatal cases, an excessive amount of mercury was found in the renal tubules. The pathological changes in the kidneys were similar to those found with acute mercuric chloride poisoning. Since no cause for death other than the mercurial damage to the kidneys was found, and since none of the patients had a previous history of kidney disease and were known to have had normal urine when the mercurial treatment was begun, the authors concluded that death was due to mercurial poisoning.

The authors pointed out that patients receiving mercurial diuretics should have close supervision with regular examination of the urine. They stated that the principal warning signs were: 1) Failure of albuminuria to decrease after satisfactory diuresis. This was felt to be, by far, the most valuable indication of tubular damage. 2) Increasing edema, especially of the arms and face, in the absence of other signs of cardiac failure. 3) Absence of diuresis after mercurial therapy.

Early recognition of the developing syndrome is of the utmost importance if a fatal outcome is to be avoided. Treatment of the fully developed syndrome is unsatisfactory.

The Formulation of an Oral Liquid Vitamin Preparation. Delgado, J. N., Lofgren, F. V., and Burlage, H. M. *Drug Standards 26:*51 (1958). A number of factors perform important roles in altering the stability properties of each vitamin in a liquid multivitamin preparation. Some factor may prove to play a favorable role in maintaining the stability of a particular vitamin but play a detrimental role in maintaining the stability of another of the vitamins in the preparation.

The authors attempted to formulate a liquid multivitamin preparation which would contain the most commonly prescribed vitamins and possess a high degree of stability. Starting with a basic formulation, the vehicle was altered to contain 20 per cent water and 80 per cent propylene glycol; 20 per cent water, 40 per cent propylene glycol, and 40 per cent glycerin; 50 per cent water and 50 per cent propylene glycol; or 70 per cent water and 30 per cent glycerin. The sequester-

ing agent disodium calcium ethylenediaminetetraacetate was added in some formulations to attempt to stabilize the catalytic oxidation of ascorbic acid by some metals. The antoxidant ethyl hydrocaffeate was included in one formulation to study the effect of this agent upon vitamin A stability. Thiamine mononitrate was employed in some formulations and thiamine hydrochloride in others since the mononitrate has been reported to show greater stability in solutions. The stability study storage period was 30 days at a temperature of 47° C.

The general results obtained from the study of these ten formulations indicated that thiamine, whether as the mononitrate or the hydrochloride, and pyridoxine were more stable in the formulations containing a minimum of water. In some formulations, the mononitrate was superior and, in others, the hydrochloride. Sequestration increased the stability of ascorbic acid and the antoxidant further increased the stability. The stability of vitamin A was increased by the presence of the antoxidant. Nicotinamide had relatively low stability but it was most stable in formulations containing the higher amounts of water. The following formula was found to be the best of those tested:

Ascorbic acid	15.0	Gm.
Nicotinamide	1.5	Gm.
Riboflavin-5-phosphate sodium	0.42	Gm.
Panthenol	0.645	Gm.
Thiamine mononitrate	0.15	Gm.
Pyridoxine HCl	0.15	Gm.
Vitamin B_{12}	300.0	mcg.
Folic Acid	37.5	mg.
Vitamin A concentrate	0.75	Gm.
Vitamin D concentrate	0.15	Gm.
Saccharin sodium	0.17	Gm.
Polysorbate 80	10.0	ml.
Sodium hydroxide 20 per cent	5.0	ml.
Lemon Oil	0.18	ml.
Rum Toffee Flavor	0.18	ml.
Burgundy Flavor	0.18	ml.
Disodium calcium EDTA	9.0	mg.
Ethyl hydrocaffeate	45.0	mg.
Propylene glycol 80 per cent Water 20 per cent q.s. ad.	90.0	ml.

The authors suggested that the following excess quantities be included in order to assure the full labeled content of the ingredients during a shelf life of two years:

Thiamine mononitrate	55 per cent
Riboflavin-5-phosphate sodium	33 " "
Ascorbic acid	23 " "
Pyridoxine HCl	16 " "
Nicotinamide	20 " "
Vitamin A	16 " "

The Use of Intravenous Fat Emulsions in Surgical Patients. Jordan, Paul H., Jr. *Arch. Surg. 76:*794 (1958). The author reported the results of a study in a large number of patients following the intravenous administration of a fat emulsion (Lipomul), particularly as regarded tolerance to both a fresh and a stored emulsion and its metabolic effects.

There were no appreciable differences noted in the number of reactions to fresh emulsion as compared with an emulsion stored for 18 months at 40° F. A total of 323 infusions of 600 ml. were given to 259 patients with no other intravenous therapy being given on the day the fat was administered. There were more reactions to emulsions which had been stored at room temperature for a period of 4 to 6 months.

A group of 47 patients were given a total of 459 therapeutic infusions of the fat emulsion, of which 89 per cent showed no reactions. Although contraindications to the use of fat emulsions have not been defined precisely, the author suggested that daily infusions be temporarily discontinued if the blood remains lipemic or if the sulfobromophthalein renal clearance test shows increased blood levels of the indicator. The author indicated that it seems desirable not to use the fat emulsion in patients with serious liver disease, in obese patients, and in patients with severe collagen diseases. It would appear that cardiac disease, hypertension, or extrahepatic jaundice does not contraindicate its use.

Metabolic studies on 3 patients on complete parenteral alimentation showed that nitrogen equilibrium could be maintained for 15

days in this manner. Since potassium deficits were observed, it was recommended that more than 40 mEq. per day be used. When the fat was increased from 90 to 180 Gm. per day, there was only slight metabolic advantage and there was some suggestion of a detrimental overloading with fat in patients weighing 55 to 60 Kg. In two patients who underwent bilateral operations one month apart and received intravenous fat following only the second operation, it appeared that nitrogen deficits following surgery can be minimized by adding adequate nitrogen and calories to the intravenous diet.

Determination of the Hydrophile-Lipophile Balance of Gums. Part 1. Chun, A. H. C., Joslin, R. S., and Martin, A. N. *Drug and Cosm. Ind. 82:*164 (1958). An assignment of hydrophile-lipophile balance (HLB) values to natural gum emulsifiers had not been undertaken previously. The authors approached the problem of doing so by preparing a series of emulsions with each of a group of natural gums in conjunction with a surfactant of known HLB value and an oil having a known required HLB value. The total concentration of the emulsifiers in each series of emulsions was kept constant but the ratio of the natural gum to the surfactant of known HLB was varied to produce emulsions having different HLB values. The total emulsifier content was kept sufficiently low to allow separation at a rate indicative of the effectiveness of the emulsifiers. Since gums increased the viscosity of the preparation, it was necessary to keep the total emulsifier content down to 0.5 per cent in all except the acacia emulsions, in which it was necessary to use a total of 3 per cent to obtain a satisfactory product. Emulsification was brought about by intermittent shaking, with a uniformity of agitation in each series, over a period of three days. All of the emulsions were prepared by weight so that the oil and water were present in equal quantities.

Initially, a series of emulsions was prepared in which the surfactant was present in the proportion of 0, 25, 50, 75, and 100 per cent of the total emulsifier content. Then, a second series was prepared, in the proportion range shown to be best by the first series, in which the surfactant to gum ratios varied from one to another by smaller increments. This procedure was repeated until the optimum ratio was obtained from a series having small ratio increments.

When the optimum ratio had been obtained, the following formula was used to calculate the HLB value for the gum:

$$HLB = \frac{R - (H \times S)}{N}$$

where R is the required HLB of the oil, H is the HLB of the surfactant, S is the weight percentage concentration of the surfactant in the total emulsifier expressed as a decimal fraction, and N is the weight percentage concentration of the natural gum in the total emulsifier expressed as a decimal fraction. On this basis, the HLB value for acacia in the particular series reported was 7.5.

BOOK REVIEWS

Experiments in Biochemical Research Techniques. R. W. Cowgill and A. B. Pardee. ix + 189 pp. John Wiley & Sons, Inc., New York, N. Y., 1957. Price: $3.50.

As the authors propose, "This book is a selection of experiments intended to illustrate some of the major research techniques of modern biochemistry." The three sections are concerned, first, with the physical and chemical methods for separation and identification of biologically important compounds including distillation, countercurrent distribution, chromatography, and electrophoresis and, second, with the biochemistry of enzymes—seventeen experiments devoted to the isolation, purification, assay, and properties of enzymes. The final section consists of seven experiments utilizing radioactive isotope tracer techniques. The first five experiments give procedures for measuring radioactivity and the last two are applications involving the use of C^{14}. The appendix gives the preparation of reagents, special assay methods, glass blowing exercises, and other information pertinent to the use of the text as a laboratory manual. Quite complete directions are given to enable the student to conduct each experiment with a minimum of confusion, but sufficient thought provoking questions are asked to require consultation of the literature for complete answers. Any graduate course in experimental biochemistry will make good use of this text as a laboratory manual or for supplementary reference purposes.

A. R. GENNARO

The Atomic Age and Our Biological Future. H. V. Brøndsted, Translated by E. M. Huggard. xiv + 80 pp. Philosophical Library, Inc., New York 16, N. Y., 1957. Price: $2.75.

Written in non-technical language for the layman, this book presents the genetic problems produced by radiation. The definition given for the curie is questionable but in other respects the content

appears to be accurate. The author has presented, by his own admission, a deliberately pessimistic view of the effects of radiation on future generations feeling compelled by conscience to warn the masses of the world of the dangers which lie before us in this atomic age. Though written with good intentions, a book presenting a biased report on this controversial topic for assimilation by the layman may contribute more to his hysteria than to his understanding.

G. D. CHASE

Bacterial Fermentations. By H. A. Barker. 95 pages. John Wiley & Sons, Inc., New York, N. Y., 1956. Price: $3.00.

This book is based upon three Ciba Lectures delivered at the Institute of Microbiology, Rutgers, State University of New Jersey, in April of 1956. Emphasis is based upon the chemistry of three different types of fermentation (methane, butyric acid-butanol, and nitrogenous compounds). In the discussion of methane fermentation, considerable attention is devoted to the isolation, classification, and nutrition of the methane bacteria. No attempt has been made to completely cover the literature and much material appears to have been omitted because of space limitation.

It is a fine synopsis of fermentation for the bacteriology student or those in allied sciences interested in the fermentation processes.

BERNARD WITLIN

Advances in Clinical Chemistry. Volume I. Edited by H. Sabotka and C. P. Stewart. 398 pages. Academic Press, Inc., New York, N. Y., 1958. Price: $12.00.

This new annual publication presents the underlying methodology, clinical significance, and interpretation of the most recent advancements in clinical chemistry. The book presents a readable account of selected important developments, written by experts in the fields

they describe: plasma iron, kidney tubular function, protein-bound iodine, I_{131} in hyperthyroidism, adrenocortical steroids, 5-hydroxyindoles, paper electrophoresis, composition of body fluids in childhood, and transaminase.

This is an excellent compendium of new concepts, techniques, and their interpretation with bibliographies to document the authors' statements and refer to the original articles wherein the techniques are described in detail. A worthwhile book to add to the library of the hospital, research, biochemical, and clinical laboratory!

BERNARD WITLIN

Our Nuclear Adventure—Its Possibilities and Perils. D. G. Arnott. xi + 170 pp. Philosophical Library, Inc., New York 16, N. Y., 1958. Price: $6.00.

Both the intelligent layman and the scientist should find this book entirely comprehensible. It is factual, informative, and interesting. The author introduces his book with several introductory chapters on basic information on atoms, radioactivity, and radiation.

The second part of the book deals with atomic weapons and constitutes a complete and well-organized report on the types of bombs, their effects and hazards resulting from bomb testing.

Power production is the subject of the third part and provides the reader with an interesting comparison of future power potentials from coal and from both nuclear fission and fusion processes. The current power problems and the nuclear power production program of Great Britain is especially discussed, as well as the biological hazards and public health problems which must be considered.

In the fourth section, problems of world importance are considered. These include the control of bomb tests and the international regulation of nuclear power.

In conclusion, the author wisely admonishes the scientist that he cannot divorce science from the responsibility for its application. This authoritative report should receive a high priority on the reading list of any layman or scientist possessing civic responsibility.

G. D. CHASE

Topics in Microbial Chemistry. F. M. Strong. xi + 166 pp. John Wiley & Sons, Inc., New York, N. Y., 1958. Price: $5.00.

This is the first volume in the E. R. Squibb Lectures on the Chemistry of Microbial Products presented at the Institute of Microbiology, Rutgers University. The book is divided into three chapters dealing with Antimycin, Coenzyme A, and Kinetin and Kinins. Each chapter is devoted to a short history, production, isolation, purification, structure, and properties of the title substances. In effect, the book can be considered a review of each of the topics discussed. A goodly number of references appear at the end of each chapter with an adequate over-all index. This small book (in physical size only) gives a capsule view of the various experimental techniques involved in the preparation of potentially physiologically active materials from bacterial sources.

A. R. Gennaro

Medical Electrical Equipment—Principles, Installation, Operation and Maintenance. Robert E. Molloy, Advisory Editor. 312 pages with 238 illustrations. Philosophical Library, Inc., New York City 16, N. Y., 1958. Price: $15.00.

The rapid and extensive advances made in the field of electronics are reflected in this notable source book. It systematically presents the electrical equipment now being used in modern-day, up-to-date hospitals. Each section is well written with detailed descriptions of hookups and systems.

The wide scope of this work makes it extremely useful to the hospital administrator and hospital architect as well as those concerned with hospital and clinic maintenance because it offers a means of quick reference and information essential to his everyday practice.

This book rightfully deserves a place in the library of those concerned with architecture, construction, and maintenance of hospitals and nursing institutions.

J. I. Feinman

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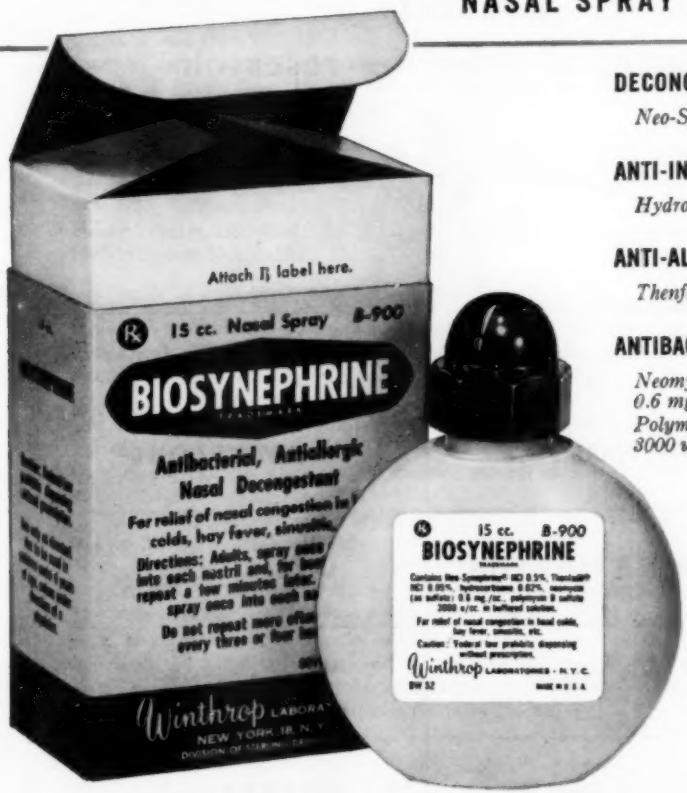

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The American Journal of Pharmacy is the oldest continuously published scientific periodical of its kind in America, having been established by the Philadelphia College of Pharmacy in 1825. After the original issue there were three other preliminary numbers until 1829, when regular publication began. From then until 1852 four issues were published annually, with the single exception of 1847, when an additional number appeared. Six issues a year were printed from 1853 to 1870, at which time the Journal became a monthly publication.

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